THE MODERATING EFFECTS OF PSYCHOLOGICAL FLEXIBILITY ON WORKLOAD VARIABILITY AND ITS AFFECTIVE OUTCOMES

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ABSTRACT

A performance decrement is consistently observed when people shift from high to low workload in laboratory studies (Cumming & Croft, 1973; Goldberg & Stewart, 1980; Matthews, 1986; Cox-Fuenzalida, 2000). Two explanations are currently debated in the literature; however, the underlying mechanism perpetuating the decrement is still unknown. This study aimed to offer evidence for the limited resource explanation by looking at psychological flexibility, a construct that is reported to increase the availability of cognitive resources. It was hypothesized that psychological flexibility would predict above and beyond condition status on the dependent variables: performance post-shift, negative affect, and workload. Multiple hierarchical regressions were conducted to assess the hypotheses and the data did not support the hypotheses. Results are discussed as well as limitations and future directions for research.

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INTRODUCTION

Employees do not often experience a constant level of high or low workload during job performance. More accurately, workload commonly fluctuates as the workday continues, resulting in variable workload. By extension, there will be periods of time when the stress that employees perceive from their workload will be greater, and performance may suffer as a result; such decrease in productivity is described as a performance decrement (Hauck, Snyder, & Cox-Fuenzalida, 2008). A few prominent examples of workload variability include air traffic control, where workload will change dramatically as the density of planes in one's sector changes (Cox-Fuenzalida & Angie, 2005). Healthcare settings such as emergency rooms also experience wide variation in the workload that the staff must address as patients clearly do not coordinate their injuries or schedule appointments. A third example cited in the literature is professional cargo carriers who experience variations in traffic patterns and congestion as they carry their merchandise to destinations (Cox-Fuenzalida & Angie, 2005).

Despite these obvious examples, the literature has not been flooded with studies about the effects of workload variability over time on job performance characteristics such as accuracy and efficiency. What research is available on workload history suggests that sudden shifts in objective workload (i.e., the amount of discrete tasks to be completed in a given segment of time) can adversely impact performance in simple laboratory tasks (Cox-Fuenzalida & Angie, 2005; Cox-Fuenzalida, Beeler, & Sohl, 2006).

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Furthermore, workload transitions can have a severe negative impact on worker stress, which can lead to feelings of frustration, depression, and even hostility (Hauck, et al., 2008; Spector, Dwyer, & Jex, 1988). It is plausible that employees experiencing workload variability will suffer from both performance decrements and negative affective outcomes. If the employee is in a safety-sensitive environment, the outcomes of shifts in workload may result in dire consequences.

In spite of the ubiquity of workload variability, the mechanisms underlying the link between performance decrements and workload history are still unclear. Currently, research has focused on two competing explanations; one that is rooted in limited attentional resources (Cox-Fuenzalida & Angie, 2005) and one that is based in ineffective strategy use by individuals (Matthews, 1986). For this reason, there has been a call in the literature for further investigation of the cause of performance decrements in variable workload situations (Cox-Fuenzalida & Angie, 2005). In this paper, an individual-level psychological factor (psychological flexibility) will be discussed and offered as a potential moderator to help explain why workload history may affect task performance. Having higher levels of psychological flexibility is associated with having more attentional resources (Bond, Flaxman, & Bunce, 2008). Therefore, if Cox-Fuenzalida and Angie's (2005) limited resources explanation for performance decrements is accurate, people with higher levels of psychological flexibility should have less performance decrement than those with lower levels of psychological flexibility.

A Brief History of Workload

Workload stems from a variety of sources: imposed task demands (regarding difficulty, number, rate of presentation of signals, and complexity), mental and physical effort exerted by the person, and subjective perceptions of demand (Huey & Wickens, 1993). Task difficulty is a product of several factors including both external and personal goals and performance criteria, cognitive processing required during the task, and the structure of the task itself. Stress is a likely outcome when a person is not able to expend the cognitive resources to meet the task requirements (McGrath, 1976). Fatigue may also accompany periods of high workload, which may contribute to a performance decrement.

Workload can be further divided into quantitative or qualitative workload. Qualitative workload is a factor of the person's perceived ability to accomplish the task at hand. Quantitative workload is contingent upon time limits, objective and subjective, rather than perceived ability (Shaw and Weekley, 1985). Measurement of workload often relies on self-reports of subjective perceptions. Despite concerns regarding the validity of self-reports of workload, correlations between objective and subjective measures of workload indicate scores do not differ as a function of measurement method (Beehr & Newman, 1978).

Originally, it was thought that personality variables were the primary determinant in whether or not individuals would be more likely to experience work overload. However, in an analysis of causal models of stressors and outcomes, Spector, Dwyer, and Jex (1988) found little support for the idea that personal dispositions have an overwhelming bearing on affective and behavioral outcomes associated with workload. Thus, it is more likely that employees' cognitive appraisal of their environment leads to subjective assessments

regarding both stress and strain, rather than predispositions of negative affect (Spector, Dwyer, & Jex, 1988). Specifically, they found that rather than inherent personality characteristics, individuals' perceptions of the environment in regards to stress were a better predictor of feelings of workload.

Similarly, Theorell and Karasek (1996) posit that it is the combination of subjective workload and perceived job characteristics that negatively influence affective and behavioral outcomes, such as dissatisfaction and anger (Spector, Dwyer, & Jex, 1988). Job dissatisfaction has been linked to poor job performance and turnover intentions as well (Kim, 2010; Spector, 1997), behavioral outcomes that organizations typically try to avoid. Furthermore, overload has negative implications for employee health. The interaction between the employee and the environment has a significant influence on well-being (Beehr & Newman, 1978). The correlation between objective and subjective overload and coronary heart disease and serum cholesterol levels has been well represented in both medical and organizational literature (Sales, 1969). Workload can also impact employee mental health, which has been measured as anxiety, low self-esteem, resentment, depression, and tension in the literature. Furthermore, the effects of workload can directly affect organizational consequences in the form of employee withdrawal: absenteeism, poor performance, and tardiness (Beehr & Newman, 1978).

The vast research on workload demonstrates that negative outcomes of work overload involve mental and physical health, sometimes leading to behaviors that have a direct relationship with the effectiveness of organizations. It is imperative that organizations

should understand the complexities of workload and its effects on performance and affective outcomes, specifically workload variability situations.

An Overview of Workload History Effects

Cox-Fuenzalida (2007) defines workload history as "prior work activity that has an effect on subsequent work activity" (p. 278). Workload history can refer to constant workload or workload shifts, defined as either a sudden increase in the number of signals an individual must attend to following a period of low workload or a significant decrease in signals following a relatively high load. Cumming and Croft (1973) further iterate that workload levels are more often varied than constant in real-life situations, warranting more research on the effects of variable workload on performance.

Cumming and Croft (1973) were the first of a few researchers to examine shifts within workload history in the context of task performance and argued that expectancy effects were responsible for the decrement experienced when workload levels suddenly decreased in an auditory monitoring task. They argued that participants essentially were not prepared for the shift in workload and thus performance suffered. Participants responded to auditory signals that were presented in recurring, cyclical patterns of high and low workload and a performance decrement was observed when the task transitioned from high workload to low workload. They contended that expectancies, based on the workload level prior to the transition, led to a sluggish performance adjustment to the new workload reality, creating a performance reduction.

Goldberg and Stewart (1980) designed a study to test this assertion. Their experimental task required participants to correctly identify the correct position of previously

presented visual stimuli, but included a cue signaling change of workload. If the performance decrement still occurred in the cue condition, then they reasoned, expectancy effects could not be the cause. A performance decrement was, in fact, still observed, demonstrating that providing participants with a cue that signaled imminent workload changes did not erase the performance deficit after a workload shift occurred (Goldberg & Stewart, 1980). Therefore, expectancies were ruled out as the primary mechanism for the effect, leading researchers to target short-term memory overload as the likely culprit. However, Goldberg and Stewart (1980) utilized tasks that were dependent on short term memory, meaning that the participants had to recall serial order information for the duration of the task, which was a limitation in their methodology.

To test the short-term memory explanation, Matthews (1986) conducted a series of studies that utilized a visual task that was not reliant on short-term memory. The first experiment assessed load history; participants were required to visually scan and correctly identify if the signal target (a mathematical expression, e.g., $24 + 14 < 27$) was present among a series of "noise" targets (mathematical equations with nonsensical symbols added) and if it was true or false (Matthews, 1986). Both high and low workload conditions allotted the participants ten seconds to provide a response; the low workload condition presented three possible targets, while the high workload condition consisted of twelve targets to scan through. The second experiment kept target load constant (i.e. the amount of target locations was not varied, but altered the target presentation rate). Even though short-term memory was not a factor in these tasks, a decrement was consistently observed when workload suddenly decreased. Similarly, the decrement was also observed in cyclical and randomized groups,

rendering Cumming and Croft's (1973) expectancies theory invalid as well. Matthews (1986) attributed this decrement to ineffective use of task strategies, or "strategic persistence" by participants.

In high workload conditions, Matthews (1986) argued that individuals utilize a speed-accuracy tradeoff. In other words, an individual works at a faster pace to complete a high volume of tasks but commits more errors in doing so (Matthews, Davies, Westerman, & Stammers, 2000). The speed-accuracy tradeoff is explained by Fitt's Law, a mathematical model which states that faster movements are less accurate, while more precise movements are made more slowly. Fitt's Law has been shown to be robust and is present using a variety of target types, sizes, and positions (Huey & Wickens, 1993). However, when workload decreases, the speed-accuracy tradeoff strategy is no longer the most effective strategy. Thus, individuals may maintain the speed and error rate that was appropriate in the high workload condition, but it is not as advantageous in the low workload condition, resulting in the performance decrement. Matthews' (1986) ineffective strategy explanation was the prevailing explanation for the performance decrement observed following a shift in workload until Cox-Fuenzalida (2000) investigated workload variability utilizing a different methodology.

Cox-Fuenzalida (2007) discussed several methodological issues in a review of the previous studies of workload transitions. The first two studies discussed (Cumming & Croft, 1973; Goldberg & Stewart, 1980) did not employ a training session for participants to become familiar with the task and create an adequate performance level. Matthews' (1986) study on workload variability did provide a training session for participants; however it was

forty minutes long and was identical to the treatment effect. This is problematic because forty minutes on a task is likely to fatigue participants and drastically decrease their interest in the task. Furthermore, using identical methods for the training and testing sessions practically negates the observed effects in the testing session. Additionally, the previous three studies either did not collect baseline data or collected inadequate baseline data (Cox-Fuenzalida, 2007).

In order to fully explain the performance decrement observed following shifts in workload, Cox-Fuenzalida (2000) conducted more extensive research. Similar to past research, she consistently found a performance decrement after a decrease in workload, but she also found a decrement immediately following an increase in workload. This study was seminal to the literature on workload variability, as it was the first to report a decrement experienced in the transition from low to high workload. Matthew's (1986) ineffective use of strategy explanation does not adequately describe why a person's performance would suffer following an increase in workload; the speed-accuracy tradeoff only applies to situations in which the individual is moving from high workload to low workload.

Research by Cox-Fuenzalida and Angie (2005) investigated workload variability in dual task situations and suggested an alternative explanation rooted in the limitations inherent in resource theory (Wickens, 2002). Resource theory states that humans have a finite amount of cognitive resources that they are able to allocate to tasks at hand. Therefore, Cox-Fuenzalida and Angie (2005) suggested that the switch in workload levels leads to resource requirements that exceed an individual's limits. Further research by Cox-Fuenzalida (2007) utilized methodology that included an analysis of the types of errors participants made. She

differentiated between errors of commission (false alarms: responses without the presence of a signal) and errors of omission (misses: failure to respond to a presented signal). Cox-Fuenzalida (2007) posited that errors of commission would suggest that Matthew's (1986) strategic persistence explanation was correct. Conversely, if there were more errors of omission, it would signal that the person's cognitive resources were depleted. Her results demonstrated that both errors of commission and omission increased during workload shifts. The significant increase in errors of omission invalidates the strategic persistence theory because people that are maintaining adequate levels of effort should not increase the rate at which they miss signals (Cox-Fuenzalida, 2007).

The argument may be raised that individuals' performance is suffering not from depletion of resources, but rather as a function of fatigue or boredom with the task. Cox-Fuenzalida (2007) analyzed this assertion with a follow-up study that required participants to perform the task for a prolonged period. She did not find significant results that the performance decrement was related to fatigue or boredom; thus, she concluded that the performance decrement must be due to the workload shift and the underlying mechanism at work. Also in support of the depleted resource explanation, research has found that social support systems in work settings can attenuate the negative outcomes observed in variable workload situations (Hauck, Snyder, & Cox-Fuenzalida, 2008). Thus, social support systems may allow the workload to be dispersed among multiple individuals, reducing the amount of resources required for each individual.

Organizational literature suggests that a performance decrement frequently accompanies shifts in workload, even among various methodologies, though there is dissent

about the underlying mechanism behind the decrement. Two of the most promising perspectives involve the ineffective use of strategies and cognitive resource depletion effects (Matthews, 1986; Cox-Fuenzalida & Angie, 2005). Cohen (1978) states that when individuals experience high workload they suffer from cognitive fatigue of attentional resources, leading to poor performance because they are unable to allocate the proper resources needed (as cited in Shaw & Weekley, 1985). The moderating influence of psychological flexibility, which is an indicator of a larger and more efficient cognitive resource pool, may offer evidence that can help tease apart these two explanations.

Psychological Flexibility as a Moderator of Workload-History Effects

Psychological flexibility is defined as the ability to remain focused on the present moment and accept negative or distracting thoughts without attempting to avoid or fixate on them (Bond, Flaxman, & Bunce, 2008), providing individuals with more cognitive resources to allocate to goal-oriented behavior (i.e. job tasks). Psychological flexibility is a component of the Relational Frame Theory (RFT) Model of Flexibility. The RFT model states that individuals' everyday lives are complicated by psychological processes that are rooted in language, particularly one's negative thoughts. People who are psychologically flexible are able to understand their internal states (fear, anxiety) without judgment and take action regardless of negativity (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). People that have lower levels of psychological flexibility exert energy either by fixating on negative thoughts (rumination) or by actively attempting to avoid them (aversion) (Bond & Bunce, 2003). Both aversion and rumination require the use of attentional resources, so performance tends to

suffer for individuals with lower levels of psychological flexibility due to the resource exhaustion.

While past literature has focused on psychological flexibility as it pertains to clinical use in the treatment of mental disorders and therapy (Bond, Hayes, & Barnes-Holmes, 2006), over the past decade, psychological flexibility has appeared more frequently in organizational literature as an important factor in job satisfaction, performance, and mental health (Bond & Bunce, 2003; Bond & Flaxman, 2006; Bond, Flaxman, & Bunce, 2008; Bond, Hayes, & Barnes-Holmes, 2006). As previously stated, psychological flexibility allows people to redirect their limited attentional resources to value-driven activities, such as high-priority tasks in the workplace (Bond, Flaxman, & Bunce, 2008). This is substantiated by the fact that higher levels of psychological flexibility have been found to be predictive of job performance (Bond & Flaxman, 2006).

The literature regarding antecedents of work performance has formerly focused on individual characteristics such as locus of control, the Big Five personality traits, emotional intelligence, and negative affectivity. However, psychological flexibility has explained organizational outcomes (satisfaction, mental health, objective measures of job performance, etc.) above and beyond other frequently studied individual traits (Bond, Hayes, & Barnes-Holmes, 2006). Unlike the former immutable traits, psychological flexibility can be improved through worksite interventions (Bond, Flaxman, & Bunce, 2008), providing an additional impetus to investigate its influence on performance decrements due to workload variability.

In general, it is expected that psychological flexibility will moderate performance and mood effects attributed to shifts in workload. In accordance with the literature, individuals with higher levels of psychological flexibility should have more attentional resources to devote to the task at hand, thus they should perform better on the task. Therefore, the following results are expected:

Hypothesis 1: It is expected that psychological flexibility will moderate the effects of workload shifts on objective task performance, such that task performance will be better after shifts for those participants high in psychological flexibility.

Hypothesis 2: It is expected that psychological flexibility will moderate the effects of workload shifts on self-reported post-task affective outcomes and stress, such that affect and stress will be more positive as a function of psychological flexibility.

METHOD

Participants

The participants consisted of 97 students from the Angelo State University psychology undergraduate and graduate participant pool in the spring of 2011. Three students did not include demographic information; of the remaining ninety-four participants, there were seventy females and twenty-four males (M = 20.0, SD = 4.2). Participation was voluntary and students participated in order to fulfill course requirements or to receive extra credit.

Measures

The Acceptance and Action Questionnaire. The Acceptance and Action Questionnaire (AAQ; Hayes, et al., 2004) is typically used to measure psychological flexibility. The instrument is reproduced in its entirety in Appendix A. It contains 16 items that assess participants' "willingness to accept their undesirable thoughts and feelings while acting in a way that is congruent with their values and goals." The AAQ is composed of two dimensions based on this definition: willingness (seven items) and action (nine items) (Bond & Bunce, 2003). Each of the items are rated on a seven-point Likert scale that ranges from "Never true" to "Always true" with higher scores corresponding to higher levels of psychological flexibility. Sample assertions include "Worries can get in the way of my success" and "I should act according to my feelings at the time."

The Dundee State Stress Questionnaire. The Dundee State Stress Questionnaire (DSSQ, Matthews et al., 2002) was used to measure participants' task-related mood and perceived workload. The instrument is reproduced in its entirety in Appendix B. The DSSQ

is made up four different subscales: mood and affect, motivation, cognitive state, and thinking styles. The mood and affect and motivation scales were used in this study. The mood and affect subscale contains a 29-item checklist measuring energization, tense arousal, hedonic tone, and anger/frustration, which are representative of both good and bad moods. The energization and hedonic tone scales were combined to provide a measure of positive affect; the tense arousal and anger/frustration scales were combined to provide a measure of negative affect. The second subscale, motivation, consists of a 14-item checklist that includes measures of perceived workload along the same dimensions (Mental Demand, Physical Demand, Temporal Demand, Performance Concern, Effort, and Frustration) as the original NASA Task Load Index (Hart & Staveland, 1988). The DSSQ was chosen because it provides a measure of subjective affective components, whereas the NASA TLX does not.

Experimental Tasks

The Sternberg Memory Task (1966) was administered to participants and consisted of five randomized letters shown on the screen for five seconds before disappearing. A probe letter appeared and the participant was instructed to push either "yes" or "no" on the keypad stating if the probe letter was present or not in the previous set of letters. Workload was manipulated by varying the presentation speed of the probe letter: in the high workload condition probe letters appeared every 0.8 seconds, whereas in the low workload condition probe letters appeared every three seconds. Events were presented randomly to each participant, but the probability of either a "letter present" or "letter absent" trial remained constant at 50% across the study. Participants were measured on their reaction times and the number of correct responses generated.

Following Cox-Fuenzalida's (2005) design, a letter detection and reporting memory task was utilized in conjunction with a distracter tone task in order to create a cognitive resource load meant to exceed individuals' limits. While completing the primary memory task, participants also listened to a series of tones at high and low frequencies played at a constant rate, every five seconds, on a second computer. They were instructed to respond only to the high tones, by hitting a specified button on a keypad.

Procedure

Each participant was randomly assigned to one of six conditions for the workload history independent variable: the high-to-low workload shift condition, the low-to-high workload shift condition, or a constant workload condition (low or high) (see Table 1). Note the extensive counterbalancing in the procedure to control for order effects. First, participants completed the AAQ and provided demographic information. Then, they listened to directions for the study using a recorded sound file on the computer. Following the presentation of the audio file, the participants were oriented to the computer input devices, which were eight-button programmable response pads designed for use with our presentation software, Superlab (version 4.0; Cedrus, Inc.).

For the Sternberg Memory Task (1966), these pads had two buttons prominently labeled "YES" and "NO" to facilitate responses. For the tone task, one button was labeled with a brightly- colored marker, indicating that this button was the one to press in response to the high tone. After this orientation was complete, a research assistant was available to answer questions before the task began. The Sternberg Memory Task (1966) began with a start screen that reiterated briefly the directions for both tasks. When ready, the participant

Table 1

Counter-Balancing and Sequencing of Training, Baseline and Testing Phases Organized By Experimental Condition

								Test	
		Training		Break	Baseline		Break	Sudden Shift	
Condition	Sequence	3 min	3 min	5 min	5 min	5min	5 min	3 min	5 min
Low to High	A	Low	High		High	Low		Low	High
	B	High	Low		High	Low		Low	High
High to Low	C	Low	High		Low	High		High	Low
	D	High	Low		Low	High		High	Low
Constant	E	Low	Low		Low	Low		Low	Low
	F	High	High		High	High		High	High

began the task by pressing the appropriate button on the response pads. As noted in Table 1, each participant engaged the task by completing three phases: the training phase, the baseline phase, and the test phase. The training phase consisted of two three-minute sessions which varied in terms of workload, depending on experimental condition, and were separated by a brief pause that lasted from one to five seconds. The participants were instructed to hit the "YES" key to resume the second half of the session, which resulted in the participants' having a couple seconds discrepancy for pause times. The low workload training session contained twenty-three trials, and the high workload training session contained forty trials. The baseline phase was comprised of two five-minute trials, which varied in workload

according to the experimental condition assigned, and the trials were separated by a brief pause. The low workload condition contained thirty-eight trials and the high workload condition contained sixty trials. The testing phase lasted eight minutes and contained a sudden workload change from either high-to-low or low-to-high workload in the experimental conditions; the control condition did not experience this shift. Importantly, the participants were not forewarned of the shift in workload. The low-to-high shift consisted of twenty-three low workload trials followed immediately by sixty high workload trials, for a total of eighty-three trials. The high-to-low workload shift consisted of forty high workload trials followed immediately by thirty eight low workload trials, resulting in a total of seventy-eight trials. Finally, between each of the three phases, participants were given five minutes to rest and were allowed to play a simple computer game to disengage their mind from the task and clear any remaining contents of working memory. Once all phases of the experimental tasks were complete, the participants completed the DSSQ and were debriefed.

RESULTS

Performance was operationally defined as correct participant responses on the Stenberg Memory task, incorrect or non-responses resulted in an error. Average scores were computed for each of the training, baseline, and testing phases to create an aggregate level of performance for each phase. As presented in Table 1, in the test or "shift" condition the high and low workload sections were presented without a break in between them, so that the participant viewed them as a continuous event; errors were scored for pre-shift, post-shift, and for ten trials immediately following the shift. For this analysis the post-shift correct percentages were used as the objective performance measure. Descriptive statistics have been provided along with preliminary analyses on the two questionnaires utilized: AAQ (Hayes, et al., 2004) and DSSQ (Matthews et al. 2002) (see Table 2). A correlation matrix of the variables is provided in Table 3, the diagonal shows reliabilities for the dependent variables.

Table 2

Means, Standard Deviations, and Ranges for Independent and Dependent Variables Measured

Variable	M	SD	Range
AAQ-Willing	28.0	4.81	16-38
AAQ-Action	45.38	5.37	30-55
DSSQ-Energy	21.22	3.87	13-28
DSSQ-Tense Arousal	21.70	5.77	8-32
DSSQ-Hedonic Tone	17.71	4.42	8-28
DSSQ-Anger	13.57	4.25	5-20
DSSQ-Negative Affect	35.27	8.66	13-50
DSSQ-Positive Affect	38.92	6.72	24-55
DSSQ-Motivation	38.12	12.57	5-66
Perceived Workload	33.67	7.33	16-52
Mental Demand	6.89	2.02	1-10
Physical Demand	2.27	2.28	0-10
Temporal Demand	6.63	2.46	1-10
Performance Estimate	6.29	1.74	2-10
Effort	6.72	2.15	1-10
Frustration	4.86	2.91	0-10

Table 3

Correlation Matrix of the Independent and Dependent Variables Measured

	AAQ - Willing	AAQ - Action	Engage	Tense Arousal	Hedonic Tone	Anger	Neg. Affect	Pos. Affect	Motivation	Wkld Percpt	Mental D	Physical D	Temporal D	Perf Est	Effort
AAQ - Willing	*.40*														
AAQ - Action	.23*	*.50*													
Engage	-.07	-.07	*.63*												
Tense Arousal	.14	.25*	.17	*.85*											
Hedonic Tone	-.08	-.13	.31**	-.49**	*.78*										
Anger	.00	.00	-.36**	.51**	-.74**	*.88*									
Neg. Affect	.09	.16	-.06	.91**	-.69**	.83**	*.89*								
Pos. Affect	-.09	-.13	.78**	-.22*	.84**	-.69**	-.49**	*.77*							
Motivation	-.04	.00	-.48**	-.17	-.29**	.31**	.05	-.47**	*.80*						
Wkld Percept	-.05	-.14	-.21*	-.41**	.23*	-.18	-.36**	.03	.36**	*.50*					
Mental D	.03	.06	-.25*	-.18	.01	.00	-.12	-.14	.27**	.66**	--				
Physical D	-.11	-.30**	-.27**	-.23*	.08	.05	-.13	-.10	.28**	.48**	.21*	--			
Temporal D	.07	-.06	-.05	-.31**	.16	-.18	-.29**	.08	.24*	.68**	.28**	.05	--		
Perf Est	.04	.04	-.07	.44**	-.35**	.42**	-.49**	-.27*	.17	-.02	-.11	-.07	-.18	--	
Effort	-.03	-.14	-.30**	-.27**	.04	.03	-.16	-.15	.43**	.76**	.53**	.24*	.48**	.16	--
Frustration	-.11	-.01	.16	-.51**	.55**	-.62**	-.64**	.46**	-.13	.56**	.26*	.10	.38**	-.47**	.14

Note. Neg. = Negative, Pos. = Positive, D = Demand, Perf Est = Performance Estimate, Wkld Percpt = Workload Perceptions
Note. Numbers on the diagonal represent Cronbach's α
Note. -- Cronbach's α is not available.
Note. * $p < .05$, ** $p < .01$

An independent samples t-test was conducted to test mean differences in percent of correct responses between the increasing workload condition and the decreasing workload condition following the shift. On average, participants in the decreasing workload condition had higher scores (M = .91, SE = .01) than those in the increasing workload condition (M = .63, SE = .04), a difference that was significant (t (35.37) = -7.31, $p < .05$). This was to be expected; and served as a manipulation check on the data. It is important that the data show that participants engaging in high workload had a lower percentage of correct responses than those engaging in low workload.

The AAQ (Hayes, et al., 2004) has different scoring based on the context in which it is employed; for example, in organizational settings it has been scaled using reverse coding on certain items and it has been summed to create two subscales of psychological flexibility, willingness and action, with higher scores representing higher levels of psychological flexibility (Bond & Bunce, 2003). The correlation between willingness and action has been provided in the correlation matrix (Table 3); they were moderately but significantly correlated (r = .23, $p < .05$). Although the correlation was significant, it was extremely low, indicating that the two subscales were measuring different facets of psychological flexibility. Prior to the primary analysis, items one, three, five, nine, ten, fourteen, fifteen, and sixteen were reverse scored on the Acceptance and Action Questionnaire.

Items one, three, seven, eleven, thirteen, fifteen, and sixteen comprised the willingness factor of psychological flexibility. The possible range of the willingness scale is seven to forty-nine, the sample studied (n = 97) had a mean score of 28.0 (SD = 4.80). The action factor of psychological flexibility consisted of the remaining items (two, four, five,

six, eight, nine, ten, twelve, and fourteen) and had a possible range of nine to sixty-three, with a mean score of 45.38 (SD = 5.37). Both scales were assessed for normality successfully. Bond and Bunce (2003) reported internal consistencies of psychological flexibility at alpha = .79 and .72 (measured at two separate times); however in this study the willing alpha coefficient = .40 and the action alpha coefficient = .61.

The mood state portion of the DSSQ (DSSQ, Matthews et al., 2002) had items two, four, seven, eleven, twelve, thirteen, fourteen, fifteen, nineteen, twenty, twenty-one, and twenty-four reverse scored. The motivation and workload scale reverse scored items three, four, six, and eight. The DSSQ consists of several subscales that can be summed to create measures of affect. Tense arousal scales (M = 21.70, SD = 5.67) and anger scales (M = 13.57, SD = 4.25) were summed to measure negative affect (M = 35.27, SD =8.66). The hedonic tone (M = 17.71, SD = 4.42) and engagement (M = 21.22, SD = 3.87) scales were summed to create a measure of positive affect (M = 38.92, SD = 6.72). The Motivation and Workload portion of the DSSQ had items three, four, six, and eight reverse scored. For this study, the internal reliabilities of the motivation scale were alpha = .80. The last six items (mental demand, physical demand, temporal demand, performance estimates, effort, and frustration) were combined to create an overall measure of workload perceptions (M = 33.67, SD = 7.33). In this study the internal reliabilities for the engagement factor alpha =.63 and the hedonic tone factor alpha = .78, combined to create a measure of positive affect scale with alpha = .77. The internal reliability of tense arousal was alpha = .85 and anger was alpha = .88, combined to create a measure of negative affect with alpha =.89. An independent samples t-test was performed to assess the difference between high and low

workload groups on overall workload perceptions, and was not significantly different between groups ($p > .05$).

To test the hypothesis that psychological flexibility moderates the effects of workload shifts on task performance, sequential regression was employed to determine if the addition of two psychological flexibility factors (action and willingness) improved prediction of performance post-shift beyond any effect of experimental condition. Table 4 shows univariate statistics for the hierarchical regression model. In all cases, experimental condition was entered first as the primary independent variable, the action factor of psychological flexibility was entered second, and the willing factor of psychological flexibility was entered third. As anticipated, the effect of experimental condition was significant, but the addition of action and willing factors of psychological flexibility did not cause a significant increase in R^2 when predicting performance post-shift. After step 3, with all of the IVs in the equation, $R^2 = .40$, $F = (1, 53) = 11.53$, $p > .05$. The first hypothesis regarding the effect of psychological flexibility on post-shift performance was not supported by the data; however, a fourth of the variability in post-shift performance is predicted by condition and psychological flexibility.

To test the first portion of the second hypothesis that psychological flexibility moderates the effects of workload shifts on negative affect, hierarchical regression was employed again in the same manner. In all cases condition was entered first as the primary independent variable, followed by the action factor second, and the willing factor third. The addition of all three variables, condition, action and willing factors of psychological

flexibility, did not cause a significant increase in R^2 when predicting participants' negative affect.

To test the second portion of hypothesis two, which stated that psychological flexibility would moderate the effects of perceived workload, a third hierarchical regression was conducted. In all cases condition was entered first as the primary independent variable, followed by the action factor second, and the willing factor third. The addition of all three variables, condition, action and willing factors of psychological flexibility, did not cause a significant increase in R^2 when predicting participants' perceived workload. These analyses indicated that neither the experimental manipulation nor the psychological flexibility factors explained variance in the post-task mood and workload measures significantly. Thus, the second hypothesis regarding the effect of psychological flexibility on post-task affect and post-task workload perceptions was not supported.

Table 4

Univariate Statistics for Predictors of Post-Shift Accuracy on the Memory Task

Model		Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
		B	Std Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	Shift Condition	.10	.02	.57	5.13	.00	.06	.14
2	Shift Condition	.10	.02	.55	5.00	.00	.06	.14
	AAQ- Action	.01	.00	.20	1.81	.08	-.00	.02
2	Shift Condition	.10	.02	.56	5.16	.00	.06	.14
	AAQ- Action	.01	.00	.17	1.55	.13	-.00	.02
	AAQ- Willing	.01	.00	.18	1.70	.10	-.00	.02

Table 5

Univariate Statistics for Predictors of Negative Affect on the Memory Task

Model		Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
		B	Std Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	Shift Condition	.33	.53	.06	.61	.54	-.74	1.39
2	Shift Condition	.19	.54	.04	.34	.73	-.89	1.26
	AAQ- Action	.25	.17	.16	1.47	.14	-.09	.59
2	Shift Condition	.13	.55	.03	.24	.81	-.96	1.23
	AAQ- Action	.24	.17	.15	1.35	.18	-.11	.58
	AAQ- Willing	.11	.20	.06	.52	.61	-.30	.51

Table 6

Univariate Statistics for Predictors of Workload on the Memory Task

Model		Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
		B	Std Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	Shift Condition	-.07	.45	-.02	-.15	.88	-.97	.83
2	Shift Condition	.04	.46	.01	.08	.93	-.87	.95
	AAQ- Action	-.19	.15	-.14	-1.29	.20	-.48	.10
2	Shift Condition	.06	.47	.01	.12	.90	-.87	.99
	AAQ- Action	-.18	.15	-.13	-1.22	.23	-.48	.11
	AAQ- Willing	-.04	.17	-.03	-.23	.82	-.38	.31

DISCUSSION

The present study attempted to provide support for the resource theory of workload variability decrements, hypothesizing that psychological flexibility would moderate the effects of workload shifts on objective task performance such that performance on the memory task would be significantly better after shifts for those participants high in psychological flexibility. The results of this study, however, did not support this hypothesis. The experimental condition (increasing workload vs. decreasing workload) did significantly impact performance, where participants in the increasing workload condition performed worse post-shift than participants in the decreasing workload performance. This was to be expected, since intuitively performance should be worse in the high workload condition as compared to the low workload condition. Neither component of psychological flexibility was predictive of the dependent measures in this study. Psychological flexibility was also hypothesized to moderate the effects of workload shifts on self-reported post-task affective outcomes and stress, such that affect and stress would be significantly more positive as a function of psychological flexibility. Participants' affect and workload perceptions were not significantly associated with experimental condition or psychological flexibility. It would be expected that people in high workload conditions would perceive higher levels of stress and that they would experience more negative emotions, in light of the lower correct responses in high workload conditions, but this was not the case. It is possible that although participants made more errors on the Sternberg Memory Task (1966), that performance was not influential on negative emotions or feelings of stress.

One of the more unusual and baffling findings in these data involved the psychological flexibility instrument itself. Psychological flexibility has only been studied recently in the organizational literature (Bond & Bunce, 2003), and the authors report that the scoring of the AAQ is different based on the organizational setting. Sometimes, certain items are reversed and two subscales are created, action and willingness, while at other times, a single scale score is used since the two factors are reported to be strongly correlated. Bond and Bunce (2003) provide an extensive report of its reportedly sound psychometric properties. However, the alpha coefficients found for this sample ($\alpha = .61$ for action and $\alpha = .40$ for willing) are much lower than the ones that Bond and Bunce (2003) found ($\alpha = .79$, $\alpha = .72$). Furthermore, although the two factors were correlated significantly, it was a low correlation ($r = .23$) and not high enough to warrant combining the two factors together as other researchers have previously done (Bond & Bunce, 2003; Bond & Flaxman, 2006; Bond, Flaxman, & Bunce, 2008). Looking beyond the low alpha scores, the items themselves do not seem to correlate very well together within their respective scales. This mounting evidence brings the psychometric properties of the AAQ into question, and clearly could have adversely affected the conclusions drawn in the current paper.

Another interesting note is that experimental condition was not predictive of workload perceptions. Thus, even though performance suffered in high workload conditions, subjective perceptions of workload did not differ significantly from those in low workload conditions. Put another way, the participants in the increasing workload condition did not report feeling higher levels of workload compared to the participants in the decreasing workload condition. This finding is contrary to previous research that has found both work

overload and underload to positively correlate with adverse reactions in employees (e.g., Spector, Dwyer, & Jex, 1988).

Another point of departure in this study compared to previous literature was the nature of the post-shift performance decrement. Contrary to the previous workload literature, a performance decrement was only observed in the increasing workload condition, and not in the decreasing workload condition. Cumming and Croft (1973), Goldberg and Stewart (1980), Matthews (1986), and Cox-Fuenzalida (2000) each found a decrement when participants shifted from low to high workload, and Cox-Fuenzalida (2000) found a decrement during high to low workload shifts. Furthermore, although a decrement was found in the increasing workload condition, the percentage correct was not significantly different between baseline and post-shift performance. In other words, people did worse post-shift when workload suddenly increased, but not significantly so. One explanation for this disconnection could be small differences in the experimental methodology employed in this study compared to previous studies. The present study was modeled after Cox-Fuenzalida and Angie (2005) in most regards, but in their study both of the training and baseline portions lasted for five minutes in each workload, and in the test portion the participants completed two minutes in either high or low workload before completing five minutes in the opposite workload. In the present study the training portion lasted for three minutes in each workload, five minutes in each baseline workload, and the test portion lasted for three and five minutes (in each respective workload). Also, participants in Cox-Fuenzalida's (2000) study were given a fifteen-minute break between the baseline and testing phases. In the present study participants were only provided a five-minute break in-between,

due to time constraints. These subtle differences may account for the lack of a decrement in the decreasing workload condition, perhaps because the shortened break was not enough time for the participants to disengage from the previous task conditions.

In light of the fact that results revealed participants' reported levels of workload were not consistent with what would be expected from their experimental condition and objective performance, it follows that psychological flexibility would not be significant either. The hypothesis suggested that psychological flexibility would moderate participants' performance post-shift, but since the participants' subjective levels of workload were not adversely affected it stands to reason that psychological flexibility may have more of an effect on workload if the participant had more invested in the activity, and the tasks' importance to real behaviors was more transparent.

Limitations are inherent in every study, and this one is no different. The low alphas found for the willing and action subscales of psychological flexibility are concerning, and may have adversely impacted any significant findings. Like the majority of studies conducted in psychology, this study utilized mostly undergraduate psychology students who completed the research for course credit. This coupled with the Sternberg Memory Task (1966), which does not easily translate to job duties, may limit the generalizability of the results. However, utilizing undergraduate and graduate psychology students as the population sample should have been acceptable because the nature of the task focused on basic cognitive functioning that was not situation-specific. It stands to reason that many other populations would be likely to have similar reactions to such changes in workload. Once the underlying

cognitive mechanism operating in performance decrements following workload shifts is identified, it will be relevant to determine the specific dynamics of the phenomenon.

One possible explanation for lack of significance may be due to the size of the sample in this study. Power is always an elusive target in human-subjects research, and the current study may have been lacking to some extent. Future studies should utilize larger sample sizes in order to increase their chances of finding a significant effect.

Perhaps most importantly, future studies should immediately be undertaken to assess the validity of the AAQ on various populations. It is possible that the AAQ used in organizational settings may not translate to student samples, but at any level, the poor reliabilities calculated in this sample are alarming, and there does not appear to be any obvious reason for the discrepancy. If psychological flexibility is to be utilized as a predictor of organizational behavior, then the construct must be validated more carefully and its measure must be critically evaluated for psychometric stability.

REFERENCES

Beehr, T. A., & Newman, J. E. (1978). Job stress, employee health, and organizational effectiveness: A facet analysis, model, and literature review. *Personnel Psychology*, 31, 665-699

Bond, F., & Bunce, D. (2003). The role of acceptance and job control in mental health, job satisfaction, and work performance. *Journal of Applied Psychology*, *88*, 1057-1067.

Bond, F., & Flaxman, P. (2006). The ability of psychological flexibility and job control to predict learning, job performance, and mental health. *Journal of Organizational Behavior Management*, *26*, 113-130.

Bond, F., Flaxman, P., & Bunce, D. (2008). The influence of psychological flexibility on work redesign: Mediated moderation of a work reorganization intervention. *Journal of Applied Psychology*, *93*, 645-654.

Bond, F., Hayes, S., & Barnes-Holmes, D. (2006). Psychological flexibility, ACT, and organizational behavior. *Journal of Organizational Behavior Management*, *26*, 25-54.

Cox-Fuenzalida, L. (2007). Effect of Workload History on Task Performance. *Human Factors*, *49*, 277-291.

Cox-Fuenzalida, L., & Angie, A. (2005). The effects of workload history on dual task performance. *Current Psychology*, *24*, 171-179.

Cox-Fuenzalida, L., Beeler, C., & Sohl, L. (2006). Workload history effects: A comparison of sudden increases and decreases on performance. *Current Psychology*, *25*, 8-14.

Cox-Fuenzalida, L., Swickert, R., & Hittner, J. (2003). Effects of neuroticism and workload history on performance. *Personality & Individual Differences*, *36*, 447.

Cumming, R. W., & Croft, P. G. (1973). Human information processing under varying task demand. *Ergonomics*, 16, 581-586.

Goldberg, R. A., & Stewart, M. R. (1980). Memory overload or expectancy effect? 'Hysteresis' revisited. *Ergonomics*, 23, 1173-1178.

Hauck, E., Snyder, L., & Cox-Fuenzalida, L. (2008). Workload variability and social support: Effects on stress and performance. *Current Psychology*, *27*, 112-125.

Hayes, S., Luoma, J., Bond, F., Masuda, A., & Lillis, J. (2006). Acceptance and Commitment Therapy: Model, processes and outcomes. *Behaviour Research & Therapy*, *44*, 1-25.

Hayes, S., Strosahl, K., Wilson, K., Bissett, R., Pistorello, J., Toarmino, D., et al. (2004). Measuring experiential avoidance: a preliminary test of a working model. *Psychological Record*, *54*, 553.

Huey, B. M., & Wickens, C. D. (Eds.). (1993). *Workload transition: Implications for individual and team performance.* Washington, DC: National Academy Press.

Kim, J. (2010). Strategic Human Resource Practices: Introducing Alternatives for Organizational Performance Improvement in the Public Sector. *Public Administration Review*, *70*, 38-49.

Matthews, M. (1986). The influence of visual workload history on visual performance. *Human Factors*, *28*, 623-632.

Matthews, G., Campbell, S. E., Falconer, S., Joyner, L. A., Huggins, J., Gilliland, K., & ... Warm, J. S. (2002). Fundamental dimensions of subjective state in performance settings: Task engagement, distress, and worry. *Emotion*, *2*, 315-340.

Matthews, G., Davies, D.R., Westerman, S.J., & Stammers, R.B. (2000). *Human performance: Cognition, stress and individual differences.* Hove, UK: Psychology Press.

McGrath, J. E. Stress and behavior in organizations. In M. Dunnette (Ed.), *Handbook of industrial and organizational psychology.* Chicago: Rand McNally, 1976.

Sales, S. M. (1969). Organizational role as a risk factor in coronary disease. *Administrative Science Quarterly*, *14*, 325-337.

Shaw, J., & Weekley, J. (1985). The Effects of Objective Work-load Variations of Psychological Strain and Post-Work-Load Performance. *Journal of Management*, *11*, 87.

Spector, P., Dwyer, D., & Jex, S. (1988). Relation of job stressors to affective, health, and performance outcomes: A comparison of multiple data sources. *Journal of Applied Psychology*, *73*, 11-19.

Spector, P. E. (1997). *Job satisfaction: Application, assessment, causes and consequences*. Thousand Oaks, CA: SAGE Publications.

Sternberg, S. (1966). High-speed scanning in human memory. *Science*, *153*, 652-654.

Theorell, T., & Karasek, R. (1996). Current issues relating to psychosocial job strain and cardiovascular disease research. *Journal of Occupational Health Psychology*, *1*, 9-26.

Wickens, C. D. (2002). Situation awareness and workload in aviation. *Current Directions in Psychological Science*, 11, 128-133.

APPENDIX A

Acceptance and Action Questionnaire

Below you will find a list of statements. Please rate the truth of each statement as it applies to you. Use the following scale to make your choice.

1	2	3	4	5	6	7
never true	very seldom true	seldom true	sometimes true	frequently true	almost always true	always true

_____ 1. I try to suppress thoughts and feelings that I don't like by just not thinking about them.

_____ 2. Despite doubts, I feel as though I can set a course in my life and then stick to it.

_____ 3. Anxiety is bad.

_____ 4. I am in control of my life.

_____ 5. When I feel depressed or anxious, I am unable to take care of my responsibilities.

_____ 6. If I promised to do something, I'll do it, even if I later don't feel like it.

_____ 7. I'm not afraid of my feelings.

_____ 8. If I get bored of a task, I can still complete it.

_____ 9. In order for me to do something important, I have to have all my doubts worked out.

_____ 10. Worries can get in the way of my success

_____ 11. I rarely worry about getting my anxieties, worries, and feelings under control.

_____ 12. I am able to take action on a problem even if I am uncertain what is the right thing to do.

_____ 13. It's OK to feel depressed or anxious.

_____ 14. I should act according to my feelings at the time.

_____ 15. I try hard to avoid feeling depressed or anxious

_____ 16. If I could magically remove all the painful experiences I've had in my life, I would do so.

APPENDIX B

Dundee State Stress Questionnaire

This questionnaire is concerned with your feelings and thoughts while you were performing the task. We would like to build up a detailed picture of your current state of mind, so there are quite a few questions, divided into four sections. Please answer every question, even if you find it difficult. Answer, as honestly as you can, what is true of you. Please do not choose a reply just because it seems like the 'right thing to say'. Your answers will be kept entirely confidential. Also, be sure to answer according to how you felt **WHILE PERFORMING THE TASK**. Don't just put down how you usually feel. You should try and work quite quickly: there is no need to think very hard about the answers. The first answer you think of is usually the best.

1. Mood State

First, there is a list of words which describe people's moods or feelings. Please indicate how well each word describes how you felt **WHILE PREFORMING THE TASK**. For each word, circle the answer from 1 to 4 which best describes your mood.

	Definitely	Slightly	Slightly Not	Definitely Not
1. Happy	1	2	3	4
2. Dissatisfied	1	2	3	4
3. Energetic	1	2	3	4
4. Relaxed	1	2	3	4
5. Alert	1	2	3	4
6. Nervous	1	2	3	4
7. Passive	1	2	3	4
8. Cheerful	1	2	3	4
9. Tense	1	2	3	4
10. Jittery	1	2	3	4
11. Sluggish	1	2	3	4
12. Sorry	1	2	3	4
13. Composed	1	2	3	4
14. Depressed	1	2	3	4
15. Restful	1	2	3	4
16. Vigorous	1	2	3	4
17. Anxious	1	2	3	4
18. Satisfied	1	2	3	4
19. Unenterprising	1	2	3	4
20. Sad	1	2	3	4
21. Calm	1	2	3	4
22. Active	1	2	3	4
23. Contented	1	2	3	4
24. Tired	1	2	3	4
25. Impatient	1	2	3	4
26. Annoyed	1	2	3	4
27. Angry	1	2	3	4
28. Irritated	1	2	3	4
29. Grouch y	1	2	3	4

2. Motivation and Workload

Please answer the following questions about your attitude to the task you have just done. For each question, circle a number from 0 to 9, according to how strongly you agree with one or other of the two extreme alternatives.

1. How motivated were you to do the task?

Not at all Very Much

0 1 2 3 4 5 6 7 8 9

2. Do you think the content of the task was:

Very dull Very Interesting

0 1 2 3 4 5 6 7 8 9

3. How eager were you to do the task?

Very eager Not at all eager

0 1 2 3 4 5 6 7 8 9

4. How do you feel after doing the task?

More cooperative More annoyed

0 1 2 3 4 5 6 7 8 9

5. How much mental effort did you exert?

Very little A great deal

0 1 2 3 4 5 6 7 8 9

6. I wanted to succeed on this task:

Very much Very little

0 1 2 3 4 5 6 7 8 9

7. How would you feel if you performed badly on this task?

Very unconcerned Very upset

0 1 2 3 4 5 6 7 8 9

8. I think doing this task was:

Very worthwhile A waste of time

0 1 2 3 4 5 6 7 8 9

9. Please rate the MENTAL DEMAND of the task: How much mental and perceptual activity was required?

Low 0 1 2 3 4 5 6 7 8 9 10 High

10. Please rate the PHYSICAL DEMAND of the task: How much physical activity was required?

Low 0 1 2 3 4 5 6 7 8 9 10 High

11. Please rate the TEMPORAL DEMAND of the task: How much time pressure did you feel due to the pace at which the task elements occurred?

Low 0 1 2 3 4 5 6 7 8 9 10 High

12. Please rate your PEFORMANCE of the task: How successful do you think you were in accomplishing the goals of the task?

Low 0 1 2 3 4 5 6 7 8 9 10 High

13. Please rate your EFFORT: How hard did you have to work (mentally and physically) to accomplish your level of performance?

Low 0 1 2 3 4 5 6 7 8 9 10 High

14. Please rate your FRUSTRATION: How discouraged, irritated, stressed, and annoyed did you feel during the task?

Low 0 1 2 3 4 5 6 7 8 9 10 High

APPENDIX C

SPSS Output 1

Means, Standard Deviations, and Ranges for Independent Variables Measured

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AAQ - Willing	97	16	38	27.89	4.81
AAQ - Action	97	33	54	44.36	4.47
Engagement	93	13	28	21.22	3.87
Tense Arousal	93	8	32	21.70	5.67
Hedonic Tone	93	8	28	17.71	4.42
Anger	93	5	20	13.57	4.25
Motivation	93	5	66	38.12	12.57
Negative Affect	93	13	50	35.27	8.65
Positive Affect	93	24	55	38.92	6.72
Workload Perceptions	93	16.00	52.00	33.67	7.33
Mental Demand	93	1	10	6.89	2.01
Physical Demand	93	0	10	2.27	2.28
Temporal Demand	93	1	10	6.63	2.46
Performance Estimate	93	2	10	6.29	1.74
Effort	93	1	10	6.72	2.15
Frustration	93	0	10	4.86	2.91

Table 3

Correlation Matrix of the Independent and Dependent Variables Measured

	AAQ - Willing	AAQ - Action	Engage	Tense Arousal	Hedonic Tone	Anger	Neg. Affect	Pos. Affect	Motivation	Wkld Percpt	Mental D	Physical D	Temporal D	Perf Est	Effort
AAQ - Willing	*.40*														
AAQ - Action	.23*	*.50*													
Engage	-.07	-.07	*.63*												
Tense Arousal	.14	.25*	.17	*.85*											
Hedonic Tone	-.08	-.13	.31**	-.49**	*.78*										
Anger	.00	.00	-.36**	.51**	-.74**	*.88*									
Neg. Affect	.09	.16	-.06	.91**	-.69**	.83**	*.89*								
Pos. Affect	-.09	-.13	.78**	-.22*	.84**	-.69**	-.49**	*.77*							
Motivation	-.04	.00	-.48**	-.17	-.29**	.31**	.05	-.47**	*.80*						
Wkld Percept	-.05	-.14	-.21*	-.41**	.23*	-.18	-.36**	.03	.36**	*.50*					
Mental D	.03	.06	-.25*	-.18	.01	.00	-.12	-.14	.27**	.66**	--				
Physical D	-.11	-.30**	-.27**	-.23*	.08	.05	-.13	-.10	.28**	.48**	.21*	--			
Temporal D	.07	-.06	-.05	-.31**	.16	-.18	-.29**	.08	.24*	.68**	.28**	.05	--		
Perf Est	.04	.04	-.07	.44**	-.35**	.42**	-.49**	-.27*	.17	-.02	-.11	-.07	-.18	--	
Effort	-.03	-.14	-.30**	-.27**	.04	.03	-.16	-.15	.43**	.76**	.53**	.24*	.48**	.16	--
Frustration	-.11	-.01	.16	-.51**	.55**	-.62**	-.64**	.46**	-.13	.56**	.26*	.10	.38**	-.47**	.14

Note. Neg. = Negative, Pos. = Positive, D = Demand, Perf Est = Performance Estimate, Wkld Percpt = Workload Perceptions
Note. Numbers on the diagonal represent Cronbach's α
Note. -- Cronbach's α is not available.
Note. * $p < .05$, ** $p < .01$

SPSS Output 3

Descriptive Statistics on Shift-Up (High Workload) and Shift-Down (Low Workload) Conditions

	Condition	N	Mean	Std. Deviation	Std. Error Mean
Percentage Correct Post-shift	High	30	.63	.20	.04
	Low	27	.91	.06	.01

SPSS Output 4

Independent Samples T Test on High and Low Workload Performance

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig.	Mean Difference	Std. Error Difference	Lower	Upper
Percentage Correct Post-shift	Equal variances assumed	20.83	.00	-7.00	55	.00	-.28	.04	-.36	-.20
	Equal variances not assumed			-7.31	35.37	.00	-.28	.04	-.36	-.20

SPSS Output 5

Hierarchical Regression with Percentage Correct, Condition, and AAQ-Willing

				Std. Error	Change Statistics				
Model	R	R Square	Adjusted R Square	of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.57[a]	.32	.31	.17	.32	26.28	1	55	.00
2	.60[b]	.36	.34	.17	.04	3.26	1	54	.08
3	.63[c]	.40	.36	.17	.03	2.89	1	53	.10

[a]Predictors: Shift Condition; [b]Predictors: Shift Condition, AAQ – Action, [c]Predictors: Shift Condition, AAQ – Action, AAQ – Willing

SPSS Output 6

Univariate Statistics for Predictors of Post-Shift Accuracy on the Memory Task

Model		Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
		B	Std Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	Shift Condition	.10	.02	.57	5.13	.00	.06	.14
2	Shift Condition	.10	.02	.55	5.00	.00	.06	.14
	AAQ- Action	.01	.00	.20	1.81	.08	-.00	.02
2	Shift Condition	.10	.02	.56	5.16	.00	.06	.14
	AAQ- Action	.01	.00	.17	1.55	.13	-.00	.02
	AAQ- Willing	.01	.00	.18	1.70	.10	-.00	.02

SPSS Output 7

Univariate Statistics for Predictors of Negative Affect on the Memory Task

Model		Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
		B	Std Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	Shift Condition	.33	.53	.06	.61	.54	-.74	1.39
2	Shift Condition	.19	.54	.04	.34	.73	-.89	1.26
	AAQ- Action	.25	.17	.16	1.47	.14	-.09	.59
2	Shift Condition	.13	.55	.03	.24	.81	-.96	1.23
	AAQ- Action	.24	.17	.15	1.35	.18	-.11	.58
	AAQ- Willing	.11	.20	.06	.52	.61	-.30	.51

SPSS Output 8

Univariate Statistics for Predictors of Workload on the Memory Task

Model		Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
		B	Std Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	Shift Condition	-.07	.45	-.02	-.15	.88	-.97	.83
2	Shift Condition	.04	.46	.01	.08	.93	-.87	.95
	AAQ- Action	-.19	.15	-.14	-1.29	.20	-.48	.10
2	Shift Condition	.06	.47	.01	.12	.90	-.87	.99
	AAQ- Action	-.18	.15	-.13	-1.22	.23	-.48	.11
	AAQ- Willing	-.04	.17	-.03	-.23	.82	-.38	.31

VITA

Michelle Ann Mitchell was born in The Colony, Texas in 1987. She graduated Magma Cum Laude with a Bachelor of Arts from Texas State University in 2009 and her Master of Science in Industrial/Organizational Psychology at Angelo State University in 2011. During her time at Angelo State University, she was the President of Psi Chi, the International Honor Society in Psychology, Vice President of the Graduate Student Psychological Association, was a member of the Society for Industrial/Organizational Psychology, and the local chapter of the Society for Human Resource Management. She has experience working at Angelo State University as a graduate assistant, a research assistant, and a teaching assistant.